May 31, 1938. P. HAGEN 2,119,230

DEVELOPER TANK FOR STRIPS OF FILM

Filed June 29, 1936

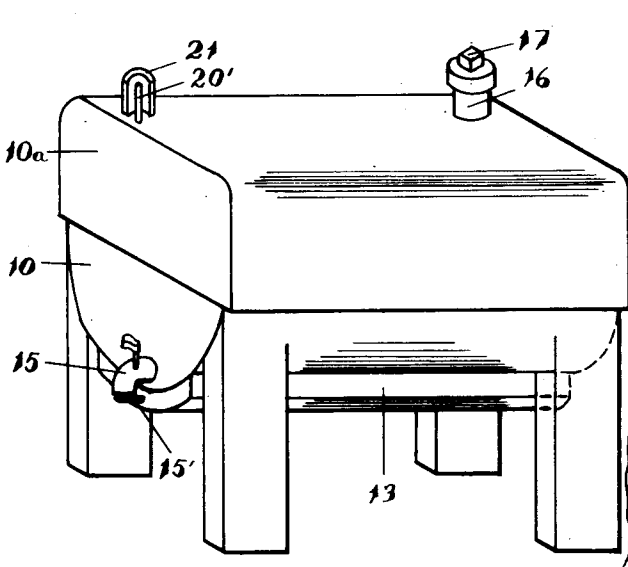


Fig. 1

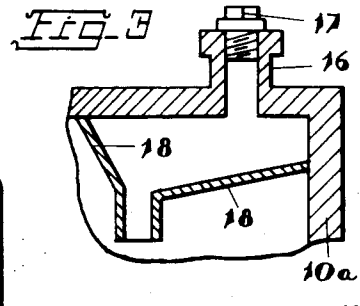


Fig. 3

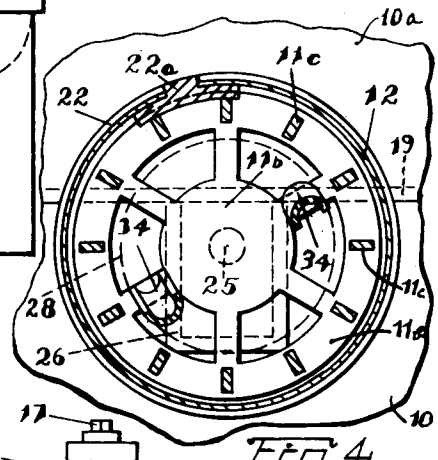


Fig. 4

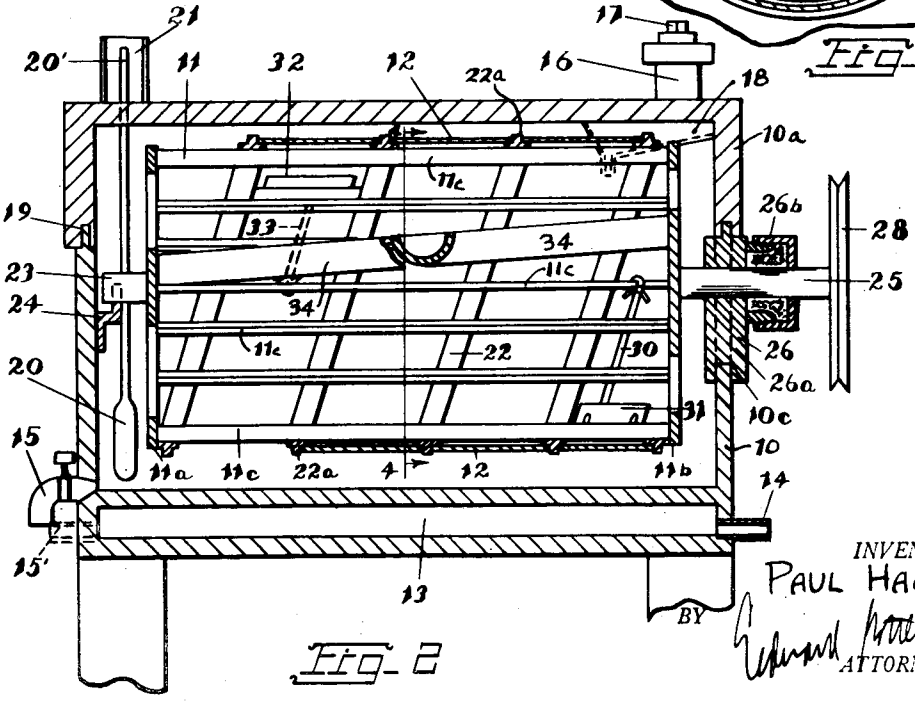


Fig. 2

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2,119,230

DEVELOPER TANK FOR STRIPS OF FILM

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11 Claims. (Cl. 95—90.5)

This invention relates to new and useful improvements in a developer tank for strips of film.

For many years it has been the general practice to develop films in dark rooms illuminated with red lights. In the last few years very sensitive films have been made which become fogged with even red lights. As a result, special variations of red lights and green lights have been employed.

With the innovation of miniature cameras the necessity for perfectly developed films has greatly increased since it is customary to make enlarged prints from the miniature films. Consequently, any defects present in the small films are greatly exaggerated, and even the slightest bit of fog may be prominently noticed on the enlarged photograph. As a result of this many professional and amateur photographers develop the highly sensitive film in totally dark rooms. This is extremely difficult since one must depend exclusively upon one's sense of touch.

This invention proposes the construction of a developer tank which is light proof and into which the films may be engaged and thereafter pass through the various stages of developing without any exposure whatsoever. Of course, it is necessary that this developer tank be used in a dark room, but its advantages resides in the fact that the films are subjected only for a short time to any possible fogging, and thereafter is developed, fixed, washed, etc. without any further possibility of light reaching them.

A further advantage gained by this arrangement resides in the fact that the films, during the greater portion of the developing, etc. are not manually handled and consequently are not subjected to scratches and other damaging marks.

In order to insulate the developer tank from light it inadvertently is also insulated from the free passage of air and consequently I have discovered that the chemical processes during the developing and fixing of the films generates sufficient heat to slightly damage the films. For example, the bubbling caused by the chemical reaction has a tendency to deposit on the film and produce defects. The invention therefore proposes the provision of a cooling system for maintaining the temperature within the developer tank at a pre-determined degree.

The invention also proposes an arrangement whereby the film may be easily mounted within the developer tank in proper position—merely by the sense of touch without the necessity of any light whatsoever within the dark room. Specifically, it is proposed to provide a drum with a spiral track upon it upon which the film may be easily engaged by the sense of touch. Further, it is proposed to so arrange the drum and the track that the film is 100% exposed to the developing, fixing, and other solutions. It is proposed to support the film at its edges so that both sides are exposed to the solutions. Prior constructions required that the film be supported with the emulsion side outwards as the inner sides rested against covering parts.

A further object of the invention resides in the provision of a novel stirrer associated with the film carrying drum and capable of stirring the liquid within the developer tank and so insure good developing.

Another object of the invention resides in providing the developer tank with a removable cover so that the film may be engaged into the tank. Furthermore, it is proposed to provide light proof joints to prevent the passage of light into the tank.

Another object of the invention proposes a very small inlet to the tank associated with a light shield so that liquid may be poured therein. Also, it is proposed to provide an arrangement for draining off the liquid. It is thus possible to use the developer, fixer, and other solutions in succession without opening the developer tank.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the following description and accompanying drawing, and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawing forming a material part of this disclosure:—

Fig. 1 is a perspective view of a developer tank for strips of film constructed according to this invention.

Fig. 2 is a vertical longitudinal sectional view of Fig. 1.

Fig. 3 is a fragmentary longitudinal sectional view of the back right hand corner of the tank shown in Fig. 1.

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 2.

The developer tank for strips of film, according to this invention, comprises a light proof tank 10 having a removable light proof cover 10a. A rotatable film carrier 11 is arranged within the tank upon which strips of film 12 may be engaged in a totally dark room. A means is provided for driving the carrier 11.

At the bottom of the tank there is an aux-

iliary compartment 13 through which refrigerating liquid may be circulated. This compartment has an inlet tube 14 and an outlet tube 15' for hoses to supply and to draw off circulating refrigerant. At the bottom of the tank 10 there is a faucet 15 through which the liquid in the tank 10 may be drawn off. The cover 10a is provided with a small neck 16 normally closed by a lightproof plug 17. It is through this neck 16 that liquid may be supplied into the tank. A light shield 18 comprises several baffles painted black or other light absorbent colors, and arranged transversely across the neck 16 and within the cover. It is thus possible to pour liquids through the neck into the tank without light being capable of reaching the film which is housed within the tank.

The joints between the cover 10a and the tank 10 are lightproof. They are formed by a flange 19 surrounding the edge of the tank and engaging into a corresponding receiving recess in the edge of the cover. Other lightproof joints and materials may be used to lightproof the tank. A thermometer 20 is arranged within the tank 10 and extends through the cover 10a to the exterior. The exterior portion 20' of the thermometer is protected by a shield 21. It is possible to read the temperature of the liquid whenever desired.

The carrier 11 comprises a pair of end discs 11a and 11b connected together with longitudinal strips 11c. A spiral track 22 is mounted around the longitudinal strips 11c. This track has a central raised portion 22a forming side shoulders upon which the film 12 may be mounted. Thus, the film is supported at its edges and the intermediate portions thereof are free and do not touch any parts so as to be exposed to the liquid.

The end discs 11a and 11b are perforated in order that liquid may pass through them. The disc 11a is provided with a shaft 23 which is supported on a bearing 24 mounted upon the inner wall of the tank. The disc 11b is provided with a shaft 25 which extends through a lightproof bearing 26 to the exterior. This lightproof bearing comprises a block 26a having edge recesses engaging the edges of a cutout 10c formed in the side wall of the tank 10. A lightproof packing gland 26b is mounted on the side of the block 26a. The bearing 24 is one from which the shaft 23 may be readily lifted. Similarly, the block 26a may be lifted from the tank. It is thus possible to remove the film carrier when desired. A pulley 28 is mounted on the extended end of the shaft 25 by which the device may be mechanically or manually driven. The driving means for the pulley, is not shown on the drawing, as it forms no part of the invention.

An elastic band 30 is attached upon one of the strips 11c and supports a clip 31 adapted to engage one end of the film 12. Another clip 32 for engaging the other end of the film is supported on a band 33 mounted upon one of the strips 11c and another portion of the carrier.

A mixer for the liquid within the tank is provided and consists of trough members 34 extended between the discs 11a and 11b at a slight inclination from end to end so that as the carrier rotates the trough members will lift up the liquid from one side of the tank and convey it to the other side of the tank, which produces a stirring action. The trough members, as shown in Fig. 4, are arranged to lift the liquid when the carrier rotates clockwise, as seen in this figure.

The operation of the device is as follows: The tank 10 is empty. The developer tank is in a totally dark room without any light whatsoever. The cover 10a is removed and the carrier 11 is accessible. The strip of film is then opened from its lightproof package and one end connected with the clip 31; then the film is wound on the carrier by manually turning it and winding it between the spiral track 22. The end of the film is held by engaging the clamp 32 on it. The cover 10a is engaged upon the tank. The film is now within a lightproof tank.

A red light or a green light, depending upon the type of film, may now be turned on in the developing room. The plug 17 may be removed, a funnel engaged into the neck 16, and developing solution poured into the tank. The plug 17 is then immediately replaced. The driving means for the carrier is turned on and the carrier will rotate in the developing solution. For miniature films it is desirable that the developing action progress very slowly and the developer may be permitted to remain in action for twenty minutes, more or less, as required. During the turning of the carrier 11 the film will be continuously immersed in the developing solution. The developing solution will be efficiently stirred by the trough members 34 picking up portions thereof and causing them to move from one end to the other end of the tank. Should the temperature within the developing tank start to rise, a source of cold water may be connected to the nipples 14 and 15' and circulated through the compartment 13. In this manner the temperature will be correct within the developing tank.

After the developing is completed the faucet 15 may be opened and the liquid drawn off. The other solutions necessary for developing, fixing, etc., are then placed into the tank one at a time for the required length of time, similar to the developer solution previously described. The carrier is operated as required for the various solutions. When the film has been completely developed, fixed, washed, etc., the cover 10a may be removed from the tank and the film 12 removed.

While I have illustrated and described my invention with some degree of particularity, I realize that in practice various alterations therein may be made. I therefore reserve the right and privilege of changing the form of the details of construction or otherwise altering the arrangement of the correlated parts without departing from the spirit or the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by United States Letters Patent is:—

1. A developer tank for films comprising an enclosed lightproof tank having a removable lightproof cover, a movable film carrier within said tank upon which film may be engaged in a totally dark room, means for driving said carrier, said carrier comprising a pair of spaced discs connected together with strips and a spiral track mounted upon said strips, said spiral track having a raised central portion forming shoulders for supporting the edges of the film.

2. A developer tank for films comprising an enclosed lightproof tank having a removable lightproof cover, a movable film carrier within said tank upon which film may be engaged in a totally dark room, means for driving said carrier, said carrier comprising a pair of spaced discs connected together with strips and a spiral track mounted upon said strips, said spiral track having a raised central portion forming shoulders for

supporting the edges of the film, and trough members mounted between said end discs and arranged with an inclination from one end to the other and adapted to stir liquid within said tank.

3. A combination stirrer and film carrier comprising a cylindrical frame, a spiral track mounted thereon and having shoulders for receiving the edges of a film to support the film so that both sides are unobstructed, means for holding said film on said track, and a trough member within said frame located at an inclination so that one end is higher than the other and capable of stirring when said cylindrical frame is rotated.

4. A combination stirrer and film carrier comprising a cylindrical frame, a spiral track mounted thereon and having shoulders for receiving the edges of a film to support the film so that both sides are unobstructed, means for holding said film on said track, and a trough member within said frame located at an inclination so that one end is higher than the other and capable of stirring when said cylindrical frame is rotated, and means for rotating said cylindrical frame.

5. In a developer tank for films, a lightproof tank member having an opening, a bearing block member removably mounted on an edge portion of said opening, lightproof elements for the adjacent edge portions of said bearing block and said tank member, a drive shaft engaging through said bearing, a film carrier removably mounted within said tank and operatively connected with said drive shaft, a lightproof cover member for said tank, and flange elements on certain of said members engageable with a receiving recess on the other of said members and surrounding said opening for lightproofing the developer tank when the cover is closed.

6. In a developer tank for films, a lightproof tank member having an opening, a bearing block member removably mounted on an edge portion of said opening a drive shaft engaging through said bearing, a film carrier removably mounted within said tank and operatively connected with said drive shaft, a lightproof cover member for said tank, a flange on certain of said members engageable with a receiving recess on the other of said members and surrounding said opening for lightproofing the developer tank when the cover is closed, and a light baffle element on said bearing block member cooperative with a complementary light baffle element on said tank member for lightproofing the junction of said bearing block and tank.

7. In a developer tank for films, a lightproof tank member having an opening, a bearing block member removably mounted on an edge portion of said opening, a drive shaft engaging through said bearing, a film carrier removably mounted within said tank and operatively connected with said drive shaft, a lightproof cover member for said tank, a flange on certain of said members engageable with a receiving recess on the other of said members and surrounding said opening for lightproofing the developer tank when the cover is closed, and a light baffle element on said bearing block member cooperative with a complementary light baffle element on said tank member for lightproofing the junction of said bearing block and tank, said elements comprising a flange engaging a recess.

8. In a developer tank for films, a lightproof tank for housing a film carrier and developing solutions and other solutions, a neck element on said tank through which liquid may be supplied thereto, a plug for closing said neck element, and a light shield within said tank in the vicinity of said neck element.

9. In a developer tank for films, a lightproof tank for housing a film carrier and developing solutions and other solutions, a neck element on said tank through which liquid may be supplied thereto, a plug for closing said neck element, and a light shield within said tank in the vicinity of said neck element, and comprising several baffles painted black or other light absorbent color and arranged transversely across said neck element.

10. A developer tank for films comprising an enclosed lightproof tank having a removable lightproof cover, a movable film carrier within said tank upon which film may be engaged in a totally dark room, means for driving said carrier, said carrier comprising a cylindrical structure, a spiral track mounted on the periphery thereof, means for holding one end of a strip of film on a portion of said cylindrical structure so that the strip of film may be upon said cylindrical structure with its edges supported on said track, and a means for holding the other end of said film upon said cylindrical structure.

11. A developer tank for films comprising an enclosed lightproof tank having a removable lightproof cover, a movable film carrier within said tank upon which film may be engaged in a totally dark room, means for driving said carrier, said carrier comprising a cylindrical structure, a spiral track mounted on the periphery thereof, means for holding one end of a strip of film on a portion of said cylindrical structure so that the strip of film may be upon said cylindrical structure with its edges supported on said track, and a means for holding the other end of said film upon said cylindrical structure, said spiral track having a raised central portion forming shoulders for supporting the edges of said film.

PAUL HAGEN.